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REVISION K
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George C. Marshall Space Flight Center
Marshall Space Flight Center, Alabama 35812

ORGANIZATIONAL ISSUANCE

QD01

QUALITY ASSURANCE PLAN FOR IN-HOUSE MANUFACTURING AND TEST

OPR(s)	OPR DESIGNEE
QD11	Gary W. Kennedy

CHECK THE MASTER LIST -
VERIFY THAT THIS IS THE CORRECT VERSION BEFORE USE

DOCUMENT HISTORY LOG

Status (Baseline/ Revision/ Canceled)	Document Revision	Effective Date	Description
Baseline		2/19/98	
Revision	A	7/1/99	Changes made to reflect new organization code changes and/or Changes made to reflect new directives renumbering scheme and to incorporate the corrective action of NCR 266
Revision	B	2/23/00	Replace document MPG 1441.1 with MPG 1440.2, MSFC Records Management Program and delete reference to canceled document QS10-QA-007 (S&MA-CR30-QA-Y-007), Quality Assurance Controls For Fabrication, Processing, and Assembly Operations.
Revision	C	9/4/02	Format and numbering change to implement requirements of QS-A-001 rev. F
Revision	D	5/5/03	Rewritten to specifically implement MPD 1280.1, MPG1280.8, MPG 1280.9 and QS-QE-001 for QS10 coverage of Space Transportation, Space Launch Initiative, and Space Shuttle In-House projects, and Facilities Engineering Department support, and to reflect the current organization.
Revision	E	5/13/04	Update to include MSFC transition to SAE AS9100.
Revision	F	10/1/04	Revised to bring document in compliance with the HQ Rules Review Action (CAITS: 04-DA01-0387). Changes were also made to reflect S&MA organizational name changes (i.e., QS to QD), and new Test Lab organization.
Revision	G	12/16/04	Administrative change, section 8 Records to None.
Revision	H	9/11/06	Revised to reflect new organization and document number changes. Deleted Preface and added shelf-life control provisions.
Revision	I	8/7/07	Deleted reference to MWI 1050.3 and MPR 1050.1. Added reference to MPR 1050.2.
Revision	J	11/5/07	Updated organization codes due to re-org; deleted reference to MWI 8715.8
Revision	K	8/11/09	Administrative revision – Updated OI template, added 3. Authority and the applicable authority, and deleted outdated URL. Changed “will” to “shall” and renumbered. Changed “organizational instruction” to “organizational issuance.” Annual update.

1. PURPOSE

This plan tailors the basic requirements for the implementation of NASA Quality Assurance policy as required by NPD 8730.5, MPD 1280.1, and QD-QE-001, for processing, test, and inspection of aerospace flight hardware, Research and Development (R&D) test articles, ground support equipment, and for hazardous test facility activation and operations. Projects may elect to use this plan for manufacturing and test activities at MSFC in lieu of or in conjunction with a project specific quality plan. This plan may also be used for work performed under task agreements, Cooperative Agreements, Space Act Agreements and Center Director Discretionary Fund (CDDF) activities, and for Quality Assurance Branch activities associated with the Facilities Engineering Department. Parenthetical references throughout this document show the relationship to SAE AS9100 provisions as required by SAE AS 9100 paragraph 4.4.4. This plan identifies Safety and Mission Assurance Directorate, Safety, Quality and Management Systems Department, Quality Assurance Branch (QD11), In-House Quality Assurance functions and responsibilities, and associated requirements and implementing procedures, for in-house operations. This plan also ties the requirements of MPD 1280.1 for in-house manufacturing and test activities to sub-tier procedures.

2. APPLICABILITY

This instruction is applicable to QD11 and the Test Area, and may be applied to other projects and activities as described in paragraph 1 above.

3. AUTHORITY and APPLICABLE DOCUMENTS

3.1 AUTHORITY

NPD 8730.5	*NASA Quality Assurance Program Policy*

3.2 APPLICABLE DOCUMENTS

NPD 8730.1	*Metrology and Calibration*
NASA-STD-8719.9	*Safety Standard for Lifting Devices and Equipment*
ISO 8402	*Quality Management and Quality Assurance Vocabulary*
MPD 1280.1	*Marshall Quality Management System Manual*
MPR 1050.2	*Space Act Agreements and Other Transactions*

MWI 1280.4	*MSFC QSDN System*
MPR 1280.6	*Internal Quality Audits*
MPR 1280.8	*Customer Satisfaction*
MGM 1280.1	*Guidance for Continual Improvement*
MPR 8040.1	*Configuration Management, MSFC Programs/Projects*
MPR 8715.1	*Marshall Safety, Health and Environmental Policy*
MPR 4000.1	*Control of Customer Supplied Product*
MPR 4500.1	*Management of Propellants and Pressurants*
MPR 5000.1	*Purchasing*
MPR 6410.1	*Handling, Storage, Packaging, Preservation and Delivery*
MPR 8040.1	*Configuration Management, MSFC Programs/Projects*
MPR 8730.1	*Inspection and Testing*
MPR 8730.2	*Inspection and Test Status*
MPR 8730.3	*Control of Nonconforming Product*
MPR 8730.5	*Control of Inspection, Measuring, and Test Equipment*
MPR 8730.6	*Inspection of Hazardous Test Facility Configuration Changes*
MPR 8823.2	*Pressure Systems Certification Requirements*
MWI 3410.1	*Personnel Certification Program*
MWI 5000.1	*Processing NASA Research Announcements (NRA's) and Cooperative Agreement Notices (CAN's)*

MWI 6410.1	*Packaging, Handling, and Moving Program Critical Hardware*
MWI 8715.10	*Explosives, Propellants and Pyrotechnics Program*
MWI 8715.15	*Operational Safety Assessment*
MWI 8715.17	*Safety Operational Readiness Review Program*
MWI 8730.3	*MSFC Material Review System*
MSFC-STD-3459	*Quality Program Provisions for MSFC Test Area Contractors*
MSFC-SPEC-164	*Cleanliness of Components For Use In Oxygen, Fuel and Pneumatic Systems, Specification For*
MSFC-STD-555	*MSFC Engineering Documentation Standard*
MSFC-STD-1800	*Electrostatic Discharge Control for Propellant and Explosive Devices*
MSFC-RQMT-2918	*Requirements for Electrostatic Discharge Control*
QD-A-012	*Professional Development Roadmap (PDRM) for Quality Assurance Specialists*
QD-QE-001	*Project Quality Instruction*
QD-QE-003	*Participation in Space Flight Program/Project Baseline Design Review*
QD-QA-003	*Quality Assurance Guidelines for Test Activities*
QD-QA-005	*Packaging, Handling and Moving Program Critical Hardware*
QD-QA-006	*Baselining and Certifying Test Facilities or Test Facility Systems*
QD-QA-009	*Penetrant Inspection*
QD-QA-012	*Use of Withhold Tags*

QD-QA-015	*Special Process Audit*
QD-QA-018	*Review of Drawings and Work Authorizing Documents (WAD's)*
QD-QA-019	*Inspection of Propellant and Explosive Devices*
QD-QA-022	*Visual Weld Inspection*
QD-QA-024	*Ultrasonic Inspection*
QD-QA-025	*Eddy Current Inspection*
QD-QA-026	*Monitoring Field Cleaning Operations*
QD-QA-028	*Magnetic Particle Inspection*
QD-QA-029	*Radiographic Film Interpretation*
ED-OWI-004	*Test Program Control*
ET10-OWI-001	*Test Program and Documentation Control*
ET01-PRO-OWI-002	*Test Operation Procedure Preparation and Change Control*
ET01-PRO-OWI-003	*Test Preparation Sheet Implementation Instructions*
ET10-OWI-005	*Procedures for Test Facility Drawings*
ET01-PRO-OWI-014	*Field Cleaning of Components, Parts, and Installed Systems*
ET10-OWI-015	*Test Readiness Review for Hazardous Operations*
ET10-OWI-016	*Deviation/Waiver Processing*
ET11-OI-001	*Contamination Control in LOX Systems*
ET11-OI-002	*Contamination Prevention*
ET13-OWI-101	*Measurement Systems Verification Process*

ET01-TOO-CERT-001	*Pressure Systems Certification Process*
ET01-STE-001	*ET50 Design and Development*
ET01-STE-002	*ET50 Design Strength Requirements*

4. DEFINITIONS

a. **Critical work**: Any hardware task that, if performed incorrectly or in violation of prescribed requirements, could result in loss of human life, serious injury, loss of mission, or loss of a significant government resource (e.g. Government test or launch facility).

b. **Complex work**: This involves either: a) the design, manufacture, fabrication, assembly, testing, integration, maintenance or repair of machinery, equipment, subsystems, systems, or platforms; or b) the manufacture/ fabrication of parts or assemblies which have quality characteristics not wholly visible in the end item and for which conformance can only be established progressively through precise measurements, tests, and controls applied.

c. **Critical but not Noncomplex work**: this includes manufacture of "build to print" piece parts or performance of a discrete manufacturing/test operation such as plating, heat treating, nondestructive testing, or laboratory testing for chemical composition or mechanical properties.

Other terms and definitions are listed in ISO 8402 and MPD 1280.1.

5. INSTRUCTIONS

5.1 Quality System Requirements

5.1.1 Policy - NASA Quality Assurance Policy, including the application of ISO 9000 and AS9100 to critical and complex work, is defined in NPD 8730.5. The MSFC Quality Management System is defined in MPD 1280.1.

5.1.2 Organization - The MSFC organization is described in MPD 1280.1. The Management Representative is appointed by the Center Director, as detailed in MPD 1280.1. (5.5.2) The responsibilities of the Safety and Mission Assurance (S&MA) Directorate for in-house activities are defined in the S&MA Charter. The S&MA Directorate, Safety, Quality and Management Systems Department (QD10), has established a Quality Assurance Branch (QD11)for the purpose of implementing the quality assurance program for in-house manufacturing and test of NASA and industry customer aerospace components and systems. QD11 also provides Quality Assurance support to the Facilities Engineering Department for approval of weld procedures and welder qualification for various contracts.

5.2 Quality Planning - Where this plan is invoked, QD11 personnel shall ensure compliance with this plan and applicable NASA and MSFC requirements for critical, complex, R&D, qualification, and flight items. This plan may be used in conjunction with the Project Quality Plan. The S&MA organization shall ensure that quality requirements are identified and satisfied throughout the In-House phase of the project. QD11 personnel shall ensure full compliance for all safety related and fracture critical items, as well as interface requirements for flight and critical ground support equipment identified by drawing or specification. Requirements documented in the hazard analysis (HA) and failure modes and effects analysis (FMEA) shall be translated into mandatory inspection points. (5.4) If a specific Quality Plan is not developed, the applicable quality surveillance and inspection requirements shall be provided by Quality Engineering in a test plan, Customer Supplied Property Arrangement, or memorandum.

The QD11 Quality Team representatives shall participate with the customer, other S&MA personnel, and test engineering personnel in establishing tailored test project quality requirements, and coordinate the implementation of these requirements. The QD11 representatives shall perform contract monitoring functions for contracts issued in support of in-house manufacturing and test activities, including performance evaluations.

For R&D programs, quality assurance requirements shall be negotiated and established during the planning phase. QD11 Quality Assurance personnel shall coordinate with the customer, other S&MA, and engineering personnel, and the extent of quality assurance coverage shall be documented in a project level plan, such as a test plan, test requirements document, or implementation plan, or in the Customer Supplied Product Arrangement (CSPA). Factors such as criticality, complexity, use of data, cost, and risk shall be considered. Quality Assurance functions are provided as a risk mitigation tool to ensure that one of a kind or high dollar test articles are handled properly, cleanliness is maintained, and that they are correctly installed, as a minimum, to protect the customer's investment and government facilities.

QD11 involvement in MSFC test facility modification, activation, operation, and maintenance shall be in compliance with applicable codes, standards, drawings, specifications, hazard analyses and any other applicable NASA, MSFC, organization and S&MA requirements documents, such as MWI 8715.15, MPR 8730.6, or ET01-PRO-OWI-003.

The QD11 Quality Team supports other S&MA and MSFC customers upon request, in areas for which they have unique training, experience, qualifications and certifications. This may include, but is not limited to, inspection services, development of training modules, audits and surveys at MSFC and at contractor facilities, support to the Academic Affairs Office, safety support, support to anomaly, failure and mishap investigations, support to special teams, support to Pressure Systems or Metrology/Calibration workgroups, drafting or review of plans and procedures, input to strategic planning, and continuous improvement initiatives.

5.3 Contract Review - MSFC may enter into Space Act Agreements, Consortiums, NASA Research Announcements or other such mutually beneficial arrangements with industry. Procedures governing this process are MPR 1050.2 and MWI 5000.1. QD11 shall implement the quality assurance requirements as defined in the Agreement through application of this plan or the establishment of a project specific plan. QD11 shall participate in the proposal process as required.

5.4 Design Control - Test article design control shall be the responsibility of the customer. MSFC quality assurance involvement and the methods for design control shall be defined in project documentation. Test requesters or customers shall maintain control of their designs during the test activities, as required by the project. Test Facility design control falls under three MSFC organizations: the Facilities Engineering Department is responsible for maintaining design control on the core facilities, commonly termed "Brick and Mortar." The Special Test Equipment Design Branch provides drawings and revisions for facility special test equipment, test fixtures, structural and piping modifications per ET01-STE-001 and ET01-STE-002. Changes to ET50 drawings which are initiated by test personnel are documented on a Test Preparation Sheet (TPS) as described in paragraph 4.5. Test Laboratory control, instrumentation and mechanical drawings and schematics, including cross country pressure systems, are controlled through the implementation of ET10-OWI-005 and a Master List (these may be either electronic or non-electronic and are controlled by a designated custodian); sketches are controlled by a TPS.

Design reviews for the test article shall be performed per project requirements. Design Review for the test facility shall be an Operational Readiness Review (ORI) per MWI 8715.17, or through the Test Readiness Review process. A Test Readiness Review (TRR) shall be held for all new test series per department instructions such as ET10-OWI-015. The TRR agenda shall include input from the ORR as applicable.

Baselining (configuration verification) of new facilities or facility modifications shall be performed per QD-QA-006. Facility Activation testing shall be performed per department instructions such as ET01-PRO-OWI-002 and ET13-OWI-101.

Deviations and waivers for test facilities controlled by Test Laboratory shall be documented on MSFC Form 847, "Deviation/Waiver Approval Request" and processed per ET10-OWI-016. (For safety waivers or variances see MPR 8715.1.)

5.5 Document and Data Control - Work Authorizing Documentation (such as TPSs and procedures) shall be controlled per department procedures such as ET01-PRO-OWI-002 and 003, or ET20-OWI-001 and -002, to prevent inadvertent use of unauthorized documentation by performing personnel. A master list or equivalent document control procedure shall be established, to identify the current revision. The Open Items List (OIL) maintained by ET10/ET60 is an example of an electronic data base which identifies all active TPS's and procedures. An electronic master list archives all open and closed TPS's.

Controls shall be established to ensure that the latest revision is available to personnel performing the operations, and that obsolete documents are promptly removed from all points of issue and use. Changes to documents shall be reviewed and approved by the same functions/organizations that performed the original review and approval unless specifically designated otherwise. Where, practicable the nature of the change shall be identified in the document or the appropriate attachments.

The designated organizations shall have access to applicable background information such as drawings, or specifications. The effectivity point of documents and changes, which affect article and material fabrication, inspection, and test operations, shall be clearly specified.

NASA qualification and flight hardware configuration shall be controlled as required by the project.

For non-flight and R&D hardware, and hardware belonging to outside customers, procedures shall be established and maintained by the test requester to control and verify the configuration to ensure that the specified requirements are met. Any QD11 responsibilities shall be designated in writing. (4.3)

5.6 Purchasing - To ensure that quality assurance requirements are integrated into MSFC procurements, the procurements shall be processed as required by MPR 5000.1. S&MA personnel shall participate in Source Evaluation Board/Source Evaluation Committee (SEB/SEC) activities, including drafting the S&MA portion of the Statement of Work and evaluating proposals. Procurements for critical, complex, flight or qualification hardware or in-house support services, shall incorporate the requirements of ISO 9000, SAE AS9100, or MSFC-STD-3459 as appropriate. Other items or services shall be reviewed for appropriate quality and technical requirements.

In-House support contractors may from time to time initiate subcontracts for items or services (e.g. tube trailer refurbishment, precision cleaning, Nondestructive Evaluation) requiring Government Source Inspection (GSI). Purchasing documentation for these items or services shall be reviewed by QD11 for inclusion of GSI requirements. Propellants and pressurants are purchased in accordance with MPR 4500.1.

Government Source Inspection is normally be provided through a Letter of Delegation to the cognizant Government Agency, as required by QD-QE-001. GSI may be performed by qualified QD11 personnel on a case-by-case basis, at customer or S&MA Lead request, or as deemed appropriate by QD11 management.

QD11 shall ensure the adequacy and implementation of the quality system in use by in-house contractors under their purview. Applicable directives and procedures contained in the MSFC Quality Assurance Plan shall be used, as well as contractor plans, procedures and applicable surveillance plans. Supplemental directives or procedures shall be developed to support this plan

when necessary. Audits of suppliers shall be performed in accordance with MWI 5330.1 and QD-QA-015. Input shall be provided to the Performance Evaluation Board (PEB) as required by the PEB plan.

5.7 Control Of Customer Supplied Product - Hardware belonging to other NASA centers, other Government Agencies, or Industry shall be controlled per MPR 4000.1 and the customer's documented requirements. QD11 shall ensure implementation of requirements for Customer Supplied Product Arrangements (CSPA) and Customer Supplied Property Tags. Quality requirements listed on the CSPA shall be adhered to.

5.8 Product Identification And Traceability - Where appropriate, procedures shall be established and maintained for identifying, inspecting, and/or testing raw materials to applicable drawings, specifications or other documents, during various stages of production, delivery and installation.

If traceability is a specified requirement, individual product or batches shall have a unique identification. This identification shall be recorded per contractor's procedures and audited by QD11.

Materials that do not conform with requirements or are awaiting completion and receipt of satisfactory test results or documentation, shall be segregated and controlled to prevent use. MSFC Withhold Tags or nonconformance documentation may be used to identify items which are nonconforming or which require additional documentation.

5.9 Process Control - All flight and qualification hardware shall be processed and inspected to approved work authorizing documentation. For R&D and test facility work, QD11 personnel shall support fabrication and critical processes performed in-house through monitoring and inspections delineated in project plans, customer agreements, Test Preparation Sheets (TPS's), drawings and procedures, and other work authorizing documents. Quality coverage shall be tailored for the individual project and agreed upon by the cognizant customer or engineering personnel.

QD11 personnel shall review and approve TPS's and procedures and incorporate mandatory inspection points (MIP's) per department procedures such as ET01-PRO-OWI-00, ET20-OWI-002, and customer, department, drawing, code or specification guidelines. Where specific inspections are not required, the process may be monitored.

QD11 supports Test Area fabrication operations, including assembly, to ensure compliance with drawings, specifications, and procedures and critical processes such as welding. Where required, hardware shall be processed using cleanliness controls as defined by ET10-OI-014, ET11-OI-001, and ET11-OI-002. If required, a foreign object damage and debris (FOD) program shall be established over and above the cleanliness controls.

Per QD-QE-001, QD11 personnel shall ensure that materials requiring shelf life controls are properly stored and are within shelf-life at the time of use. QD11 personnel shall ensure that materials with expired shelf life are discarded, or processed through the appropriate nonconformance documentation and material review board system.

5.10 Inspection and Testing - Inspection planning is performed on flight hardware, designated ground support equipment, qualification hardware, and designated R&D hardware. Inspection planning is also performed for test facility activation and operation, and for work performed under Space Act Agreements, Cooperative Agreements, NRAs, and CDDFs as required. Planning shall incorporate requirements of Failure Mode Effects Analysis, Critical Items List (FMEA/CIL), hazard analysis, test plans, drawings, specifications, codes, requirements and consideration of the proper work environment per QD-QA-018 and ET01-PRO-OWI-003, and project specific quality plans.

QD11 shall be responsible for working with other S&MA, engineering, or customer personnel to establish inspection requirements. These requirements shall be transmitted to cognizant QD11 Quality Assurance personnel for incorporation into work authorizing documentation. Inspection results shall be documented on work authorizing documentation.

Receiving Inspection shall be performed in accordance with QD-QA-001. Mechanical and electrical components or assemblies are inspected in the receiving area of building 4705. If receiving inspection of large test articles or components is required at the test site, QD11 personnel shall coordinate the receiving inspection function as required. An explosives receiving inspection, consisting of count and condition, and adherence to Department of Transportation and safety regulations, is performed in the Redstone Arsenal explosives receiving area by Army personnel. More detailed inspections, if required, shall be performed in the Army explosives area, the Test Area, or other area approved by Industrial Safety, per QD-QA-019 and applicable TPS's or procedures. Receiving inspection of liquid propellants and pressurants is performed by the Test Operations contractor.

In-process inspection shall be performed in accordance with requirements defined on TPS's, procedures and other work planning documentation as applicable. Critical processes shall be monitored as required by the process procedure or customer, and as deemed necessary by QD11 personnel. Test facility welding shall be inspected per QD-QA-022. Cleaning of cross-country lines and pressure vessels shall be monitored per QD-QA-026.

Nondestructive Evaluation (NDE) shall be performed by certified personnel in accordance with work authorizing documents and QD-QA-009, QD-QA-024, QD-QA-025, QD-QA-028, and QD-QA-029. When NDE is witnessed, QD11 personnel shall ensure compliance with approved procedures, and documentation of results. Test reports and radiographs shall be reviewed as a part of data package.

Flight and qualification hardware shall be assembled and tested in accordance with approved procedures. Configuration shall be verified during assembly as required by the customer. Any required pretest inspections shall be performed and documented. QD11 personnel shall perform test surveillance as required by QD-QA-003 to ensure compliance with the test plan and test procedure, and that deviations or anomalies are documented and dispositioned. QD11 personnel shall also ensure closure of constraints prior to test. Post-test inspections shall be performed as required by the test plan and applicable procedures or customer request.

Qualification test articles shall be monitored by QD11 to assure qualification testing is performed in accordance with test requirements, and approved test procedures.
For R&D test programs, the extent of quality coverage for assembly and test of the test article shall be per customer requirements, Test Lab requirements or the hazard analysis. QD11 may make recommendations for quality coverage based on criticality, complexity, use of data, cost, and risk. Inspections shall be performed per project requirements and documented on a TPS or procedure. Assembly of the test article, Facility Activation Procedures (FAP's), Facility Operation Procedures (FOP's), and Test and Checkout Procedures (TCP's) shall be monitored or surveillance performed as required by the customer, procedure or hazard analysis. Department Organizational issuances (OI's), such as ET10-OWI-001, ET01-PRO-OWI-002, ET01-PRO-OWI-003, and QD-QA-003 provide further details for test activities and implementation of requirements. Note: Some test activities may be of such a low risk, hazard and technology readiness level that continuous surveillance is not required, and monitoring by QD11 is limited.

Test articles which belong to industry partners, other government agencies, or other NASA centers, shall be inspected as required by a customer agreement. The test requester shall supply the requirements. Hardware shall be controlled per paragraph 4.7 above.

Pressure Vessels and Systems are managed by Test Lab through the Test Operations Contract. The contractor provides engineering, trades and quality assurance personnel for this effort, and is required to comply with the contractor's Quality Manual and MPR 8823.2. QD11 personnel shall perform surveillance of this effort and perform inspections as deemed necessary.

5.11 Inspection, Measuring and Test Equipment – Measurement and calibration requirements for inspection, measuring, and test equipment shall be in accordance with NPD 8730.1, MPR 8730.5, and/or by the defining program/project/customer requirements. The MSFC Calibration Laboratory is operated by the MSFC fabrication services contractor, administered by the Engineering Directorate, monitored by QD11, and is audited per supplier audit requirements. QD11 personnel shall ensure that inspection, measuring and test equipment are calibrated are calibrated, as evidenced by a current calibration sticker, and are appropriately utilized to perform the measurement within the stated requirement. QD11 personnel shall verify that self-calibrating equipment is checked as required by the owner's manual prior to use.

Serial/equipment control numbers and calibration due dates of tools and equipment shall be noted in procedures where applicable and verified by QD11.

Equipment shall be controlled by department or contractor procedures. QD11 shall also designate a Point(s) of Contact for control of equipment assigned to the Quality Assurance Teams.

Measurement systems calibration is described in applicable performing organization OIs.

5.12 Inspection and Test Status – S&MA shall implement a stamp control system in compliance with MPR 8730.2. Quality Assurance personnel shall be issued stamps for the purpose of hardware and software acceptance, for acceptance of steps within a procedure or TPS, and for procedure, TPS and Discrepancy Report (DR) closure.

Stamps shall be traceable to the individual performing the acceptance. Record keeping and audits shall be administered by a designated stamp control custodian.

For electronic work authorizing document systems, inspections, verifications and acceptance shall be recorded electronically and password protected.

5.13 Control of Nonconforming Product - Nonconformance controls for NASA flight and in-scope hardware shall be implemented per MPR 8730.3, or as required by the project or test customer. Nonconformance controls shall be implemented on designated development test articles, as required by the project or customer. Nonconformance controls are also implemented on Test Lab test facilities and pressure systems per ET01-PRO-OWI-003. On-site contractors shall control and disposition nonconformances in accordance with their contracts and quality plans. The Constellation Program implements the Constellation Problem Reporting and Corrective Action (CxPRACA) Report process. The MSFC requirements for recording, dispositioning, closing and maintaining records of nonconformances are outlined in the above procedures. These procedures present requirements for initiating, processing, and closing of Discrepancy reports (DR's), Test Discrepancy Reports (TDR's), CxPRACA Reports, Squawk Tags (Squawks), and Quality Test Preparation Sheets (QTPS's). Withhold Tags shall be applied to items as required per QD-QA-012.

Material Review Board (MRB) actions shall be conducted in accordance with the applicable quality plan or approved procedure. QD11 personnel shall participate in the MRB, as required. If the test article nonconformance is dispositioned by a contractor's MRB, QD11 shall participate as required by the project or contract/cooperative agreement.

5.14 Corrective and Preventive Action – Corrective and preventive action for test facility hardware shall be implemented per ET01-PRO-OWI-003. An annual review of QTPSs shall be performed by QD11 for trending. For serious or continuing deficiencies in management system compliance, a Quality System Deficiency Notice shall be processed per MWI 1280.4. On-site contractors shall use procedures approved for their contract and QD11 shall verify compliance.

For the test articles, corrective and preventive action shall be performed as required by the customer.

5.15 Handling, Storage, Packaging, Preservation, and Delivery - For items designated as Program Critical Hardware (PCH), the following requirements documents shall be adhered to: MPR 6410.1, MWI 6410.1, QD-QA-005, and NASA-STD-8719.9 Foreign Object Damage/Foreign Objects and Debris (FOD) programs shall be implemented as required by the customer.

For large, high cost, hazardous, or one of a kind items such as test articles or pressure vessels, which are not PCH, but which require special handling, procedures shall be written for transportation and handling that shall ensure the integrity of the hardware. When requested by the responsible organization, or required by hazard analysis, QD11 personnel shall ensure compliance with approved procedures.

Solid rocket motors, propellant, and explosive devices shall be moved and handled in accordance with MWI 8715.10 and MSFC-STD-1800, and applicable procedures written to detail the specific operation and approved by the Industrial Safety Department.

Flight hardware, qualification hardware, test articles, ground support equipment and precision cleaned components and assemblies shall be packaged and stored to prevent contamination and degradation. Precision cleaned items shall be packaged and handled per MSFC-SPEC-164 or other applicable specification. QD11 responsibilities with respect to field cleaning operations and maintaining cleanliness are documented in QD-QA-026 for cross country or storage systems, and ET10-OI-014 for test facilities.

QD11 shall review for concurrence, prior to release, those procedures and instructions describing the controls for handling, storage, preservation, marking, labeling, packaging, packing, and shipping operations as required. Effective implementation of these documents shall be assured through inspections, monitoring, special evaluations, and verification of certified personnel and equipment.

5.16 Control of Records – QD11 shall ensure that records of the results fabrication, processing, test monitoring/surveillance and inspection are in accordance with the requirements of department OI's, such as ET01-PRO-OWI-001, -002 and -003 , and contract requirements. These records shall provide documented evidence, including dates and acceptance stamps, that required operations and associated inspections have been completed, verified, and accepted by the person who performed the work and the inspector, engineer and/or technician who accepted the operation. QD11 shall ensure that records are maintained as specified by the customer or department requirements.

Records include but are not limited to, TPS's, hard cards, supplier data, laboratory analyses, nonconformance reports, Material Review Board (MRB) dispositions, receiving inspection

records, FAP's, FOP's, calibration records, in-process and end item inspection/test records, waivers and deviations, and TCP's, test data, weld maps, NDE reports.

5.17 Internal Quality Audits - The MSFC Internal Audit Program shall meet the requirements of MPR 1280.6. QD11Quality Assurance personnel shall support or participate as required, and perform surveillance audits or audits of special processes and contract monitoring mini-audits in accordance with QD-QA-015.

5.18 Training - Only trained, qualified and certified personnel shall perform the various tasks associated with inspection and surveillance, fabrication, assembly, test, and transportation and handling. Training and certification shall include such disciplines as mechanical inspection, electrical inspection, welding inspection, explosives inspection, NDE, program critical hardware (PCH) handling, and training/certification in the specific skill or craft. Training and certification shall be provided as needed for personnel involved in hazardous operations. Training may be obtained from an outside source, such as a private company, a university, or other government agency. Quality Assurance personnel shall ensure that personnel performing tasks requiring special training and certification are properly trained and certified as required by MWI 3410.1, QD-A-012, or the contractor's training and certification plan as applicable.

QD11 personnel shall also be familiar with NASA, MSFC, and S&MA policy and procedures. Whenever possible, personnel shall attend classes related to the fields of technology to which they are assigned.

5.19 Servicing - If required, QD11 shall ensure contractors comply with the requirements of their contracts for servicing at MSFC, or that any servicing performed by MSFC is in compliance with customer requirements.

5.20 Statistical Techniques - Statistical techniques such as Pareto diagrams, histograms, and other stratification and trending methods may be used as necessary to assist in performing the mission assurance function.

5.21 Software Quality Assurance (SQA) – QD11 shall work with other S&MA or customer personnel to ensure the implementation of software requirements in accordance with QD-QA-007, and QD-QA-008, as required by the project, or applicable department or customer requirements.

5.22 Customer Satisfaction- QD11 personnel shall participate in the implementation of the S&MA customer satisfaction policy, as required by MPR 1280.8, and shall maintain a customer oriented approach to all activities. Customer feedback shall be reviewed and any necessary actions taken to improve service.

Continual Improvement- QD11 personnel shall support the Center and S&MA continual improvement efforts as outlined by MGM 1280.1. Personnel shall provide recommendations for

improvements, corrective action, assist with audits, and work with the customer on a daily basis to improve processes. Improvements shall be tracked and forwarded to S&MA management.

6. NOTES

None.

7. SAFETY PRECAUTIONS AND WARNING NOTES

None.

8. APPENDICES, DATA, REPORTS, AND FORMS

None.

9. RECORDS

None.

10. TOOLS, EQUIPMENT, AND MATERIALS

None.

11. PERSONNEL TRAINING AND CERTIFICATION

None

12. FLOW DIAGRAM

None.